# APPENDIX B

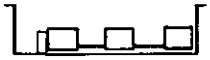
## Forms

In completing the STS 100 form on the facing page, please use the following standard terms (if applicable) for payload configurations.

## Spacelab module and pallet configurations


1 pallet


2 pallets


3 pallets


4 pallets

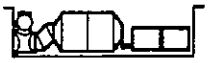

5 pallets


Short module with 2 pallets


Short module with 3 pallets

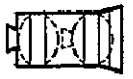

Long module


Long module with 1 pallet


Long module with 2 pallets

## Interim upper stage configurations


Two stage


Twin stage


Planetary


Planetary pioneer

## Spinning solid upper stage configurations

Delta class

Atlas-Centaur class

STS 100 FORM REQUEST FOR FLIGHT ASSIGNMENT DATE:

To: SPACE TRANSPORTATION SYSTEMS OPERATIONS
MAIL CODE MO
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON D.C. 20546

FROM: _____
_____
_____
_____
/S/

FLIGHT OBJECTIVES:

___ Earnest money ___ NASA approved
___ Commercial ___ ESA approved
___ Other Government ___ DOD approved

Flight period _____ or specific date _____

Inclination range _____ or specific inclination _____

Altitude range _____ or specific altitude _____

Payload configuration _____

Flight duration, hours attached _____ Discipline _____

FLIGHT TYPE:
___ Deployment
___ Attached
___ Servicing
___ Retrieval

Crew complement: Commander, pilot, mission specialist plus option for additional mission specialist(s) _____ or payload specialist(s) _____

Payload Operations Control Center support:

_____ GSFC _____ JPL _____ JSC _____ Other _____ Not required _____

STDN and Tracking and Data Relay Satellite system support (comment):

Payload mass properties including flight kits:

Specify flight kits used in weight: (see JSC-07700, Volume XIV)

| | | | |
|---|---|---|---|
| Weight: | Launch | _____ lb. | _____ kg |
| | Landing | _____ lb. | _____ kg |
| Diameter: | Launch | _____ inches | _____ mm |
| | Landing | _____ inches | _____ mm |
| Length: | Launch | _____ inches | _____ mm |
| | Landing | _____ inches | _____ mm |

Payload kWh estimate _____ kWh

Payload constraints and/or unique requirements:

Orientation, pointing, sunlight constraints, etc. (comment):

Special prelaunch and postlanding off-line support at launch and landing site (comment):

Special prelaunch and postlanding on-line support while in the Orbiter (comment):

March 1977 (OVER)

Other comments:

Those organizations that will be non-U.S. Government users should also provide the following information:

- Do you request a dedicated flight? If so, do you intend to sublet services to other users?
- Do you request consideration in STS exceptional program selection process?
- Are you willing for your payload to fly on a space-available (standby) basis?
- Do you request your payload to be flown under the definition of a "small self-contained payload"?
- State desired date to begin contract negotiations.
- Does payload (or payloads) require revisit and/or retrieval services?
- List known optional services currently under consideration in order that flight requirements can be established.

Space Transportation System flight assignment

[STS User Handbook, May 1977]

Firm, tentative, and unassigned flights

| Status | Government fiscal year (Oct. 1-Sept 30) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | '79 | 80 | 81 | 82 | 83 | 84 | 85 | |
| Total | 3 | 6 | 13 | 23 | 42 | 56 | 60 | → Continues at 60 per year |
| Firm | 3 | 3 | 0 | 0 | 0 | 0 | 0 | |
| Tentative | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Unassigned | 0 | 3 | 13 | 23 | 42 | 56 | 60 | |

Orbital flight test phase

| Assigned flight number | Date | Launch site | User | Cargo | Flight objectives |
|---|---|---|---|---|---|
| 1 | Mar. 1979 | KSC | NASA | Development flight instrumentation pallet | Orbital flight test |
| 2 | July 1979 | KSC | NASA | Development flight instrumentation pallet; payload TBD | Orbital flight test |
| 3 | Sept. 1979 | KSC | NASA | Development flight instrumentation pallet; payload TBD | Orbital flight test |
| 4 | Dec. 1979 | KSC | NASA | Development flight instrumentation pallet; payload TBD | Orbital flight test |
| 5 | Feb. 1980 | KSC | NASA | Development flight instrumentation pallet; payload TBD | Orbital flight test |
| 6 | Mar. 1980 | KSC | NASA | Development flight instrumentation pallet, payload TBD | Orbital flight test |

## Operational buildup phase

| Assigned flight number | Date | Launch site | User | Cargo | Flight objectives |
|---|---|---|---|---|---|
| 7 | May 1980 | KSC | | | |
| 8 | July 1980 | KSC | | | |
| 9 | Sept. 1980 | KSC | | | |
| 10 | Oct. 1980 | KSC | | | |
| 11 | Dec. 1980 | KSC | | | |
| 12 | Jan. 1981 | KSC | | | |
| 13 | Feb. 1981 | KSC | | | |
| 14 | Mar. 1981 | KSC | | | |
| 15 | April 1981 | KSC | | | |
| 16 | May 1981 | KSC | | | |
| 17 | June 1981 | KSC | | | |
| 18 | June 1981 | KSC | | | |
| 19 | July 1981 | KSC | | | |
| 20 | Aug. 1981 | KSC | | | |
| 21 | Sept. 1981 | KSC | | | |
| 22 | Sept. 1981 | KSC | | | |
| 23 | Oct. 1981 | KSC | | | |
| 24 | Nov. 1981 | KSC | | | |
| 25 | Nov. 1981 | KSC | | | |
| 26 | Dec 1981 | KSC | | | |
| 27 | Dec 1981 | KSC | | | |
| 28 | Jan. 1982 | KSC | | | |
| 29 | Jan. 1982 | KSC | | | |
| 30 | Feb. 1982 | KSC | | | |
| 31 | Feb. 1982 | KSC | | | |
| 32 | Mar. 1982 | KSC | | | |
| 33 | April 1982 | KSC | | | |
| 34 | April 1982 | KSC | | | |
| 35 | May 1982 | KSC | | | |
| 36 | May 1982 | KSC | | | |
| 37 | May 1982 | KSC | | | |
| 38 | June 1982 | KSC | | | |
| 39 | July 1982 | KSC | | | |
| 40 | July 1982 | KSC | | | |
| 41 | Aug. 1982 | KSC | | | |
| 42 | Aug. 1982 | KSC | | | |
| 43 | Sept. 1982 | KSC | | | |
| 44 | Sept. 1982 | KSC | | | |

# APPENDIX C

## Glossary of terms

**aft flight deck**
That part of the Orbiter cabin on the upper deck where payload controls can be located.

**airlock**
A compartment, capable of being depressurized without depressurization of the Orbiter cabin, used to transfer crewmembers and equipment. A similar compartment in the Spacelab module is used to expose experiments to space.

**announcement of flight opportunity**
The process by which proposed investigations are solicited for a specific space flight.

**announcement of flight periods**
The process by which proposed investigations are solicited for space flight within a designated time period, but without a specific flight number identification. The flight period may include plans for one or more flights.

**Atlas-Centaur class**
Payloads weighing approximately 4000 to 4400 pounds (1800 to 2000 kilograms).

**azimuth**
True launch heading from KSC or VAFB measured clockwise from 0° north.

**barbecue mode**
Orbiter in slow roll for thermal conditioning.

**beta angle**
Minimum angle between the Earth-Sun line and the plane of the orbit.

**capture**
The event of the remote manipulator system end effector making contact with and firmly attaching to a payload grappling fixture. A payload is captured at any time it is firmly attached to the remote manipulator system.

**cargo**
The total complement of payloads (one or more) on any one flight. It includes everything contained in the Orbiter cargo bay plus other equipment, hardware, and consumables located elsewhere in the Orbiter that are user-unique and are not carried as part of the basic Orbiter payload support.

**cargo bay**
The unpressurized mid part of the Orbiter fuselage behind the cabin aft bulkhead where most payloads are carried. Its maximum usable payload envelope is 15 feet (4.6 meters) in diameter and 60 feet (18.3 meters) long. Hinged doors extend the full length of the bay.

**cargo bay liner**
Protective soft material used to isolate sensitive payloads from the bay structure.

**cargo integration review**
Part of STS planning process that results in a cargo manifest, cost per flight, and billing schedule.

**cargo integration test equipment**
Setup at KSC that can provide testing of both payload-to-payload and cargo-to-Orbiter interfaces.

**certificate of compliance**
Documentation prepared by the user confirming that a payload has successfully completed interface verification.

**commander**
This crewmember has ultimate responsibility for the safety of embarked personnel and has authority throughout the flight to deviate from the flight plan, procedures, and personnel assignments as necessary to preserve crew safety or vehicle integrity. The commander is also responsible for the overall execution of the flight plan in compliance with NASA policy, mission rules, and Mission Control Center directives.

**common payload support equipment**
Spacelab-provided mission-dependent equipment that consists of a top airlock and a viewport/window assembly.

**core segment**
Section of the pressurized Spacelab module that houses subsystem equipment and experiments.

**crew activity planning**
The analysis and development of activities to be performed in flight by the crew, resulting in a time line of these activities and reference data for each flight.

**deadband**
That attitude and rate control region in which no Orbiter reaction control subsystem or vernier correction forces are being generated.

**deep space network**
Communications network managed by the Jet Propulsion Laboratory for command and control of all planetary flights.

**Delta class**
Payloads weighing approximately 2000 to 2500 pounds (900 to 1100 kilograms).

**deployment**
The process of removing a payload from a stowed or berthed position in the cargo bay and releasing that payload to a position free of the Orbiter.

**European Space Agency**
An international organization acting on behalf of its member states (Belgium, Denmark, France, Federal Republic of Germany, Italy, the Netherlands, Spain, Sweden, Switzerland, and the United Kingdom. The ESA directs a European industrial team responsible for the development and manufacture of Spacelab.

**experimenter**
A user of the Space Transportation System who ordinarily will be an individual whose experiment is a small part of the total payload.

**experiment racks**
Removable and reusable assemblies in the Spacelab module that provide structural mounting and connections to supporting subsystems (power, thermal control, data management, etc.) and experiment equipment.

**experiment segment**
Section of the pressurized Spacelab module that houses experiments and sensors.

**external tank**
Element of the Space Shuttle system that contains liquid propellant for the Orbiter main engines. It is jettisoned prior to orbit insertion.

**extravehicular activity**
Activities by crewmembers conducted outside the spacecraft pressure hull or within the cargo bay when the cargo bay doors are open.

**extravehicular mobility unit**
A self-contained (no umbilicals) life support system and anthropomorphic pressure garment for use by crewmembers during extravehicular activity. It provides thermal and micrometeoroid protection.

**flight**
The period from launch to landing of an Orbiter — a single Shuttle round trip. One flight might deliver more than one payload; more than one flight might be required to accomplish a single mission.

**flight control team**
An element of the MCC on duty to provide real-time support for the duration of each STS flight.

**flight data file**
The onboard complement of crew activity plans, procedures, reference material, and test data available to the crew for flight execution. There will normally be an STS flight data file for STS crew activities and also a payload flight data file for payload crew activities.

**flight-dependent training**
Preparation of a mission or payload specialist(s) for a specific flight, depending on the mission goals. Part of the training involves integrated simulations with the rest of the flight crew and ground teams.

**flight design**
The trajectory, consumables, attitude and pointing, and navigation analysis necessary to support the planning of a flight.

**flight-independent training**
Standard preparation of a mission or payload specialist for any flight.

**flight kit**
Optional hardware (including consumables) to provide additional, special, or extended services to payloads. Kits are packaged in such a way that they can be installed and removed easily.

**flight manifest**
The designation of a flight, assignment of the cargo to be flown, and specific implementing instructions for STS operations personnel.

**flight phases**
Prelaunch, launch, in orbit, deorbit, entry, landing, and postlanding.

**flight types**
Payload deployment and retrieval, on-orbit servicing of satellites, and on-orbit operations with an attached payload, as suited to the purposes of a mission. A single flight may include more than one of these purposes.

**free-flying system**
Any satellite or payload that is detached from the Orbiter during operational phases and is capable of independent operation.

**igloo**
A pressurized container for Spacelab pallet subsystems when no module is used.

**inclination**
The maximum angle between the plane of the orbit and the equatorial plane.

**instrument pointing subsystem**
Spacelab hardware and software for precision pointing and stability for experiment equipment.

**integration**
A combination of activities and processes to assemble payload and STS components, subsystems, and system elements into a desired configuration, and to verify compatibility among them.

**interface**
The mechanical, electrical, and operational common boundary between two elements of a system.

**interface verification**
Testing of flight hardware interfaces by an acceptable method that confirms that those interfaces are compatible with the affected elements of the Space Transportation System.

**interim upper stage**
Solid propulsive upper stage designed to place spacecraft on high Earth orbits or on escape trajectories for planetary missions.

**launch pad**
The area at which the stacked Space Shuttle undergoes final prelaunch checkout and countdown and from which it is launched.

**launch-readiness verification**
The process of ensuring the continuing operational capability of the Space Shuttle system, upper stages, and Spacelab.

**launch site support manager**
Individual at KSC who is the single point of contact with users in arranging payload processing at the launch site.

**Long Duration Exposure Facility**
Free-flying reusable satellite designed primarily for small passive or self-contained active experiments that require prolonged exposure to space. It is launched in the Orbiter cargo bay and deployed and retrieved by the remote manipulator system.

**manned maneuvering unit**
A propulsive backpack device for extravehicular activity. It uses a low-thrust, dry, cold nitrogen propellant.

**mission**
The performance of a coherent set of investigations or operations in space to achieve program goals. A single mission might require more than one flight, or more than one mission might be accomplished on a single flight.

**Mission Control Center**
Central area at JSC for control and support of all phases of STS flights.

**mission-dependent equipment**
Spacelab optional equipment that can be added to a flight if needed for the mission involved.

**mission-independent equipment**
Spacelab subsystem and support equipment that is carried on every Spacelab flight.

**mission kit**
Flight kit is the preferred term.

**mission specialist**
This crewmember is responsible for coordination of overall payload/STS interaction and, during the payload operations phase, directs the allocation of the STS and crew resources to the accomplishment of the combined payload objectives. The mission specialist will have prime responsibility for experiments to which no payload specialist is assigned, and/or will assist the payload specialist when appropriate.

**mission station**
Location on the Orbiter aft flight deck from which payload support operations are performed, usually by the mission specialist.

**mixed payloads**
Cargo containing more than one type of payload.

**mobile launch platform**
The structure on which the elements of the Space Shuttle are stacked in the Vehicle Assembly Building and are moved to the launch pad.

**mobility aid**
Handrails or footrails to help crewmembers move about the spacecraft.

**module**
Pressurized manned laboratory suitable for conducting science, applications, and technology activities.

**module exchange mechanism**
Part of the Multimission Modular Spacecraft flight support system that is used for servicing.

**Multimission Modular Spacecraft**
Free-flying system built in sections so that it can be adapted to many missions requiring Earth-orbiting remote-sensing spacecraft. It is launched in the Orbiter cargo bay and deployed and retrieved by the remote manipulator system.

**multipurpose support group**
Element of the MCC responsible for preflight planning, procedures development, systems expertise, and manpower. During a flight, this group reports systems and trajectory status to the flight control room.

**multiuse mission support equipment**
Hardware available at the launch site for handling payloads, or common flight hardware used by various payload disciplines.

**nadir**
That point on the celestial sphere vertically below the observer, or 180° from the zenith.

**off-line integration**
Assembly of payload elements or multiple payloads that does not involve any STS element.

**on-line integration**
Mating of payloads with the Orbiter, Spacelab, or upper stage. Level I is with the Orbiter. Level II is with the Spacelab, upper stage, etc.

**operations planning**
Performing those tasks that must be done to ensure that vehicle systems and ground-based flight control operations support flight objectives.

**orbital flight test**
One of first six scheduled developmental space flights of the Space Shuttle System.

**orbital maneuvering subsystem**
Orbiter engines that provide the thrust to perform orbit insertion, circularization, or transfer; rendezvous; and deorbit.

**Orbiter**
Manned orbital flight vehicle of the Space Shuttle system.

**Orbiter Processing Facility**
Building near the Vehicle Assembly Building at KSC with two bays in which the Orbiter undergoes postflight inspection, maintenance, and premate checkout prior to payload installation. Payloads are also installed horizontally into the Orbiter in this building.

**pallet**
An unpressurized platform, designed for installation in the Orbiter cargo bay, for mounting instruments and equipment requiring direct space exposure.

**pallet train**
More than one pallet rigidly connected to form a single unit.

**payload**
The total complement of specific instruments, space equipment, support hardware, and consumables carried in the Orbiter (but not included as part of the basic Orbiter payload support) to accomplish a discrete activity in space.

**payload canister**
Environmentally controlled transporter for use at the launch site. It is the same size and configuration as the Orbiter cargo bay.

**payload carrier**
One of major classes of standard payload carriers certified for use with the Space Shuttle to obtain low-cost payload operations. The payload carriers are identified as habitable modules (Spacelab) and attached but uninhabitable modules (pallets, free-flying systems, satellites, and upper stages).

**payload changeout room**
An environmentally controlled room at the launch pad for inserting payloads vertically into the Orbiter cargo bay.

**payload discipline training**
Preparation of a mission or payload specialist for handling a specific experiment. This training is usually the responsibility of the user.

**Payload Operations Control Center**
Central area, located at any of three NASA centers, from which payload operations are monitored and controlled. The user, in many instances, will have direct command of a payload from this control center.

**payload preparation room**
Facility at the Vandenberg Air Force Base launch pad for processing and checking payloads.

**payload specialist**
This crewmember, who may or may not be a career astronaut, is responsible for the operation and management of the experiments or other payload elements that are assigned to him or her, and for the achievement of their objectives. The payload specialist will be an expert in experiment design and operation.

**payload station**
Location on the Orbiter aft flight deck from which payload-specific operations are performed, usually by the payload or mission specialist.

**payload supplier**
Owner/operator of any Space Shuttle payload.

**pilot**
This crewmember is second in command of the flight and assists the commander as required in the conduct of all phases of Orbiter flight.

**planning operations management team**
Element of the MCC that performs preflight functions and assists the user in requesting facilities, software, command, telemetry, and flight requirements and POCC interfaces.

**principal investigator**
Research scientist who is in charge of the conduct of an experiment carried by any STS element.

**program**
An activity involving manpower, material, funding, and scheduling necessary to achieve desired goals.

**racks**
Same as experiment racks.

**reaction control subsystem**
Thrusters on the Orbiter that provide attitude control and three-axis translation during orbit insertion, on-orbit, and reentry phases of flight.

**remote manipulator system**
Mechanical arm on the cargo bay longeron. It is controlled from the Orbiter aft flight deck to deploy, retrieve, or move payloads.

**retrieval**
The process of utilizing the remote manipulator system and/or other handling aids to return a captured payload to a stowed or berthed position. No payload is considered retrieved until it is fully stowed for safe return or berthed for repair and maintenance tasks.

**simulator**
A heavily computer-dependent training facility that imitates flight hardware responses.

**solid rocket boosters**
Element of the Space Shuttle that consists of two solid rocket motors to augment ascent thrust at launch. They are separated from the Orbiter soon after lift-off and recovered for reuse.

**Spacelab**
A general-purpose orbiting laboratory for manned and automated activities in near-Earth orbit. It includes both module and pallet sections, which can be used separately or in several combinations.

**Space Shuttle**
Orbiter, external tank, and solid rocket booster.

**space tracking and data network**
A number of ground-based stations having direct communications with NASA flight vehicles.

**Space Transportation System**
An integrated system consisting of the Space Shuttle (Orbiter, external tank, solid rocket booster, and flight kits), upper stages, Spacelab, and any associated flight hardware and software.

**spinning solid upper stage**
Propulsive upper stage designed to deliver spacecraft of the Delta and Atlas-Centaur classes to Earth orbits beyond the capabilities of the Space Shuttle.

**stability rate**
The maximum angular rate error during steady state limit cycle operation.

**stowing**
The process of placing a payload in a retained position in the cargo bay for ascent or return from orbit.

**tilt/spin table**
Mechanisim installed in Orbiter cargo bay that deploys the spinning solid upper stage with its spacecraft.

**Tracking and Data Relay Satellite system**
Two-satellite communication systems providing principal coverage from geosynchronous orbit for all STS flights.

**trainer**
A training device or facility that provides primarily a physical representation of flight hardware. It may have limited computer capabilities.

**upper stage**
Spinning solid upper stage or interim upper stage. Both are designed for launch in the Orbiter cargo bay and have propulsive elements to deliver payloads into orbits and trajectories behond the capabilities of the Shuttle.

**user**
An organization or individual requiring the services of the Space Transportation System.

**utilization planning**
The analysis of approved (funded or committed) payloads with operational resources, leading to a set of firm flight schedules with cargo manifests.

**Vehicle Assembly Building**
High-bay building near KSC launch pad in which the Shuttle elements are stacked onto the mobile launch platform. It is also used for vertical storage of the external tanks.

**Western Launch Operations Division**
NASA operation at Vandenberg Air Force Base.

**zenith**
That point of the celestial sphere vertically overhead. The point 180° from the zenith is called the nadir.

# APPENDIX D

## Acronyms

| | |
|---|---|
| AMPS | atmosphere, magnetosphere, and plasmas in space |
| APP | astrophysics payloads |
| APS | auxiliary power subsystem |
| APU | auxiliary power unit |
| ASE | airborne support equipment |
| ATL | advanced technology laboratory |
| AWG | American Wire Gauge |
| BN | ballistic number |
| CADSI | communications and data systems integration |
| CITE | cargo integration test equipment |
| CRT | cathode-ray tube |
| CSTA | crew software training aid |
| DOD | Department of Defense |
| Domsat | domestic satellite |
| DSN | deep space network |
| ECS | environmental control system |
| ESA | European Space Agency |
| EVA | extravehicular activity |
| EVAL | Earth-viewing application laboratory |
| FTS | Federal telecommunications system |
| GNP | gross national product |
| GSE | ground-support equipment |
| GSFC | Goddard Space Flight Center |
| HRDR | high rate digital recorder |
| HRM | high rate multiplexer |
| IMU | inertial measurement unit |
| IPS | instrument pointing subsystem |
| IUS | interim upper stage |
| JPL | Jet Propulsion Laboratory |
| JSC | Lyndon B. Johnson Space Center |
| KSC | John F. Kennedy Space Center |
| LaRC | Langley Research Center |
| LDEF | Long Duration Exposure Facility |
| LSSM | launch site support manager |
| MCC | Mission Control Center (at JSC) |
| MMS | Multimission Modular Spacecraft |
| MSFC | Marshall Space Flight Center |

| | |
|---|---|
| NA | not applicable |
| NASCOM | NASA communications network |
| OMS | orbital maneuvering subsystem |
| OPF | Orbiter Processing Facility (at KSC) |
| ORB 1-g | Orbiter one-g trainer |
| OV | Orbiter vehicle |
| PCR | payload changeout room (at launch site) |
| POCC | Payload Operations Control Center |
| POMT | planning operations management team |
| POP | perpendicular to orbit plane |
| RAU | remote acquisition unit |
| RCS | reaction control subsystem |
| RIU | remote interface unit |
| RMS | remote manipulator system |
| SAEF-1 | Spacecraft Assembly and Encapsulation Facility no. 1 |
| SIPS | small instrument pointing system |
| SLS | Spacelab simulator (at JSC) |
| SMS | Shuttle mission simulator (at JSC) |
| SPP | solar physics payloads |
| SSUS | spinning solid upper stage |
| SSUS-A | spinning solid upper stage for Atlas-Centaur class spacecraft |
| SSUS-D | spinning solid upper stage for Delta class spacecraft |
| STDN | space tracking and data network |
| STS | Space Transportation System |
| TDRSS | Tracking and Data Relay Satellite system |
| TEMS | transport environment monitoring system |
| VAB | Vehicle Assembly Building (at KSC) |
| VAFB | Vandenberg Air Force Base |
| $X_L$ | X-axis of Spacelab |
| $X_o$ | X-axis of Orbiter |
| $X_p$ | X-axis of payload |
| $Y_L$ | Y-axis of Spacelab |
| $Y_o$ | Y-axis of Orbiter |
| $Y_p$ | Y-axis of payload |
| $Z_L$ | Z-axis of Spacelab |
| $Z_o$ | Z-axis of Orbiter |
| $Z_p$ | Z-axis of payload |

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